Patent
Attorney's Docket No. 154562/0341-034

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of	)	
	)	
Carlo BACCIOTTINI	)	Group Art Unit: 3745
	)	
Application No.: 10/596,922	)	Confirmation No.: 2369
	)	
Filed: June 29, 2006	)	Examiner: Jesse M. Prager
	)	
For: DISK OF A DISK ROTOR FOR A GAS TURBINE	)	
	)	
	)	
	)	
	)	

APPEAL BRIEF PURSUANT TO 37 C.F.R § 41.37

Sir:

Further to the Notice of Appeal filed on January 4, 2010 and in connection with the above-identified application submitted herewith is the Appeal Brief.

(i) **REAL PARTY IN INTEREST**

The real party in interest is the assignee, Nouvo Pignone Holding S.p.A.

(ii) **RELATED APPEALS AND INTERFERENCES**

To the best of the undersigned's knowledge, there are no related appeals or interferences.

(iii) **STATUS OF CLAIMS**

Claims 1-5, 7-9, and 11-22 are currently pending, have all been rejected two or more times, and are all the subject of this appeal.

(iv) **STATUS OF AMENDMENTS**

No Amendments have been submitted in this application subsequent to the Notice of Appeal of January 4, 2010. However, after the Final Office Action dated October 1, 2009, a Request for Reconsideration has been submitted on November 30, 2009 and entered by the Examiner.

(v) **SUMMARY OF CLAIMED SUBJECT MATTER**

According to exemplary embodiments, a disk of a disk rotor for a gas turbine is configured to have high dynamic characteristics, such as flexural and torsional inertia, and at the same time to be strong and stable as disclosed, for example, at lines 4-9, on page 2 of the originally filed specification. These features are not easily achievable as the rotors are made up of a series of disks axially constrained by a series of tie rods as disclosed, for example, at lines 20-24, on page 1 of the originally filed specification. The tie rods are inserted into holes formed in the disks as shown, for example, in Figure 1 (see holes 27). These holes weaken the structure of the disks.

Further, the disks have plural slots (see element 50 in Figure 1) in which vanes are attached. By positioning the slots relative to the holes such that an angle between a reference point of a slot and a central point of an adjacent hole of the series of holes is between 2 and 10 sexagesimal degrees, the novel disk exhibits high resistance and also high flexural and torsional inertia characteristics as disclosed, for example, at lines 5-15, on page 8 of the originally filed specification.

Independent Claim 1 recites a disk (element 20 in Figure 2 or page 3, lines 19-24) of a disk rotor for a gas turbine. The disk (element 20 in Figure 2) includes a central portion (element 22 in Figure 1 or page 3, line 25) having a central axis pass-through hole (element 23 in Figure 2 or page 4, lines 21-22 or see intersection of lines II-II an VI-VI in Figure 1), a first collar (element 30 in Figures 2 and 3, or page 4, lines 21-24) situated at a first end and a second collar (element 40 in Figure 2 or page 4, lines 21-

24) situated at a second end of the central portion (element 30 in Figure 2). The disk has an intermediate portion (element 24 in Figures 1 and 2 or in paragraph bridging pages 3 and 4) disposed around the central portion (element 22 in Figure 1). The disk has an outer portion (element 28 in Figures 1 and 2 or paragraph bridging pages 3 and 4) disposed around the intermediate portion (element 24 in Figures 1 and 2). The outer portion (element 28 in Figures 1 and 2) has a series of axial pass-through holes (elements 27 in Figure 1 or page 4, lines 5-8) configured to receive a series of tie rods and has a series of slots (elements 50 in Figure 1 or page 4, lines 17-20) configured to house a corresponding series of vanes.

The series of holes (elements 50 in Figure 1) is positioned in the outer portion (element 28 in Figure 1) of the disk so as to obtain high dynamic characteristics of the rotor and at the same time a sufficient useful life thereof (page 8, lines 5-15). Each slot (element 50 in Figure 2) has a reference point (element 80 in Figures 2, 5, 7 and 8 or page 7, lines 17-24) for placing a corresponding vane.

An angle (element 83 in Figure 1 or paragraph bridging pages 7 and 8) between the reference point (element 80 in Figures 2, 5, 7, and 8) of a slot (element 50 in Figure 1) and a central point (see intersection of line 61 with line VI-VI in Figure 1) of an adjacent hole (element 27 in Figures 1 and 7) of the series of holes (elements 27 in Figure 1) is between 2 and 10 sexagesimal degrees. The reference point (element 80 in Figures 2, 5, 7, and 8) is defined by an intersection of (i) an axis (line 82 in Figures 7 and 8 or page 7, lines 20-23) of the slot (element 50 in Figures 7 and 8) in a middle side

section of the disk with (ii) an extension (upper dash line in Figure 8) of a side surface (element 29 in Figure 8 or page 7, lines 20-23) of the outer portion (element 28 in Figures 1 and 8), the axis (element 82 in Figures 7 and 8) of the slot (element 50 in Figure 1) being radial (see line incident on line 29 at point 80 in Figures 2 or 8) from an axial direction (dash line parallel to line 23 in Figure 2) of the disk (element 20 in Figure 2).

Independent Claim 14 is directed to a disk (element 20 in Figure 2 or page 3, lines 19-24) of a disk rotor. The disk (element 20 in Figure 2) includes a central portion (element 22 in Figure 1 or page 3, line 25) having a central axis pass-through hole (element 23 in Figure 2 or page 4, lines 21-22 or see intersection of lines II-II an VI-VI in Figure 1). The disk has an intermediate portion (element 24 in Figures 1 and 2 or in paragraph bridging pages 3 and 4) disposed around the central portion (element 22 in Figure 1). The disk has an outer portion (element 28 in Figures 1 and 2 or paragraph bridging pages 3 and 4) disposed around the intermediate portion (element 24 in Figures 1 and 2). The outer portion (element 28 in Figures 1 and 2) has a series of axial pass-through holes (elements 27 in Figure 1 or page 4, lines 5-8) and has a series of slots (elements 50 in Figure 1 or page 4, lines 17-20) in a side surface (element 20 in Figure 2) of the outer portion (element 28 in Figure 2).

Each slot (element 50 in Figure 2) has a reference point (element 80 in Figures 2, 5, 7 and 8 or page 7, lines 17-24) for placing a corresponding vane. An angle (element 83 in Figure 1 or paragraph bridging pages 7 and 8) between the reference

point (element 80 in Figures 2, 5, 7, and 8) of a slot (element 50 in Figure 1) and a central point (see intersection of line 61 with line VI-VI in Figure 1) of an adjacent hole (element 27 in Figures 1 and 7) of the series of holes (elements 27 in Figure 1) is between 2 and 10 sexagesimal degrees, and the reference point (element 80 in Figures 2, 5, 7, and 8) is defined by an intersection of (i) an axis (line 82 in Figures 7 and 8 or page 7, lines 20-23) of the slot (element 50 in Figures 7 and 8) in a middle side section of the disk with (ii) an extension (upper dash line in Figure 8) of a side surface (element 29 in Figure 8 or page 7, lines 20-23) of the outer portion (element 28 in Figures 1 and 8), the axis (element 82 in Figures 7 and 8) of the slot (element 50 in Figure 1) being radial (see line incident on line 29 at point 80 in Figures 2 or 8) from an axial direction (dash line parallel to line 23 in Figure 2) of the disk (element 20 in Figure 2).

(vi) **GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

A number of grounds of rejection are raised by the Examiner and listed below. Appellant requests review of all grounds of rejection on appeal.

Claims 1-5, 7-9, and 11-22 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

Claims 1-5, 7-9, and 11-13 were rejected under 35 U.S.C. § 103(a) as unpatentable over Mannava (U.S. Patent No. 5,522,706) in view of Nagaoka (JP 57-193701) and in further view of Walker et al. (U.S. Patent No. 6,106,233, herein "Walker").

Claims 14-17 and 21-22 were rejected under 35 U.S.C. § 103(a) as unpatentable over Mannava in view of Walker.

Claims 18-20 were rejected under 35 U.S.C. § 103(a) as unpatentable over Mannava in view of Walker, and in further view of Nagaoka.

(vii) **ARGUMENTS**

I. Rejection under 112, second paragraph is improper

The independent claims have been discussed above. As independent Claim 1 recites representative features that are believed by the Examiner to be indefinite, the following discussion is based on Claim 1. However, the discussion applies equally to all of the independent claims.

The last Office Action contends that Claims 1, 11, 14, and 15 contain claim limitations that are not clear. Specifically, regarding Claims 1 and 14, the last Office Action contends that the claimed feature "the axis of the slot being radial from an axial direction to the disk" is not clear as it "may be interpreted to mean at least that either that the axis of the slot **is tilted** radial from the axial direction of the disk, or **is positioned** radially outwards relative to the central axis pass-through hole."

Regarding Claims 11 and 15, the last Office Action contends that the claimed feature of the slots being tilted "vertically" is not clear as "the vertical direction is not clearly defined." These contentions are respectfully traversed for the following reasons.

It is respectfully submitted that the record fails to establish a prima facie case of indefiniteness.

"The essential inquiry regarding the definiteness requirement of 35 U.S.C. § 112 is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity." Manual of Patent Examination

Procedure [hereinafter MPEP] § 2173.02 (8th Ed. 2001) (Rev. 7, July 2008).

"Definiteness of claim language must be analyzed, not in a vacuum, but in light of:

(1) the content of the particular application disclosure;

(2) the teachings of the prior art; and

(3) the claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made."

Id. The Office has the initial burden of providing some analysis as to why a recitation is "vague and indefinite." Id.

Absent in the record is any application of the above factors expressly set forth by the MPEP. For example, the last Office Action is completely silent on the issue of the content of the particular application disclosure. Instead, with respect to the feature "the axis of the slot being radial from an axial direction to the disk", the last Office Action merely concludes that the feature is indefinite because it is subject to two potential interpretations.

With respect to the features of Claims 11 and 15 reciting the slots being tilted "vertically," the last Office Action concludes the feature is indefinite because the vertical direction is not defined. These conclusions are not supported by any analysis of the above factors. Accordingly, it is respectfully submitted that this lack of analysis precludes the establishment of a prima facie case of indefiniteness.

Further, regarding Claims 1 and 14, it is respectfully submitted that just because a claim feature is subject to multiple interpretations, it is not indefinite. That is, as noted in MPEP § 2173.04, "[b]readth of a claim is not to be equated with indefiniteness."

In view of the above, it is respectfully submitted that the record fails to establish a prima facie case of indefiniteness of Claims 1-5, 7-9, and 11-22.

Moreover, it is respectfully submitted that the content of the particular application disclosure offers guidance with respect to the feature "the axis of the slot being radial from an axial direction to the disk." For example, the specification expressly notes the "axis of the slot of the middle side section of the disk 20, shown in figure 8." Finally, Figure 8 depicts the axis of the slot.

Similarly, regarding Claims 11 and 15, the claims themselves provide guidance in interpreting the term "vertically." Specifically, the claims recite the series of the slots is tilted both axially and vertically relative to axial and vertical directions of the disk. Thus, the tilt of the series of slots is discussed ***relative to*** the disk itself. Further, as explained at page 7 of the specification, "the slots are tilted with respect to the axis of the disk itself in two directions, axial and vertical."

In view of the above, it is respectfully submitted that Claims 1-5, 7-9, and 11-22 are definite and the rejection of the claims under 112, second paragraph should be reversed.

II. Rejection of Claims 1-5, 7-9, and 11-22 under the combination of Mannava, Nagaoka and Walker is improper

a. Mannava, Nagaoka and Walker do not teach or suggest the claimed angle

Independent Claims 1 and 14 subject matter has been discussed above.

The standard under which obviousness, or non-obviousness, must be decided was set forth in *Graham v. John Deere*, 383 U.S. 1 (1966). Therein, the court indicated that a proper review of the question involves (a) determining the scope and content of the prior art, (b) determining the level of ordinary skill in the prior art, (c) the differences between the claimed invention and the prior art and, if present (d) secondary considerations, such as commercial success. When combining the teachings of a first prior art reference with teachings from a second prior art reference, some reason or motivation for one of ordinary skill in the art to have made the combination must be identified. *C.R. Bard Inc. v. M3 Sys. Inc.*, 157 F.3d 1340 (Fed. Cir. 1998). The recent case of *KSR v. Teleflex*, 550 U.S. 398 (2007), did not absolve decision makers of the need for providing a reason or motivation to combine, but did explain that the sources or rationale to be used were not subject to rigid formulation, e.g., indicating that courts can "take account of inferences and creative steps that a person of ordinary skill in the art would employ". These tenets of patent law are applied below to the circumstances of the rejection of the claims involved in this appeal.

Turning to the applied art, Mannava is directed towards laser shock peened disks with loading and locking slots for turbo machinery. More specifically, Mannava shows in

Figure 1 a rotor disk 2 having plural slots 54 cut into a rim 10 of the disk 2 and plural holes 18 formed under rim 10. However, Mannava is completely silent about defining a reference point relative to a slot 54 and also about defining an angle of the reference point relative to a hole 18 in the disk 2. Moreover, the last Office Action concedes in the last line on page 6 that "Mannava does not teach the specific dimension of the angle."

The last Office Action, addressing similar features to those discussed above with regard to Claim 1, contends that the specific dimensions of the angle would have been an obvious matter of design choice. Specifically, the last Office Action contends in the first paragraph on page 7 that "applicant has not disclosed that having the specific dimension of the angle solves any stated problem or is for any particular purpose above the fact that the angle or relative position ... reduces the stress concentration and it appears that the disk of Mannava would perform equally well with a shape and having the dimensions as claimed by applicant." This contention is respectfully traversed for the following reasons.

First, the last Office Action's own admission that the application does in fact disclose that "the angle or relative position ... reduces stress concentration ..." is respectfully noted. This statement on its own is an admission that the angle or relative position is relevant, and thus is not simply a design choice.

Second, as discussed in the specification, the angle or relative position of the slots with respect to the holes is related to mechanical and thermal stresses caused by vanes during the functioning of the turbine. Specifically, page 7, second full paragraph,

of the specification indicates that "[n]umerous tests and analyses have been effected which have revealed that the relative portion of the vanes with respect to the holes, is extremely important." Then, on page 8, second full paragraph, the specification explains:

"With reference to figure 7, it can be noted that, by thus positioning the slots with respect to the holes, a sufficiently resistant section is obtained, which allows a good resistance to cyclic stress and consequently a sufficient useful life of the component."

This appears to be an indication of an unexpected result.

At the same time, having positioned the holes of the series of holes 27 in the outer portion of the disk 20, preferably on the circumference 61, high flexural and torsional inertia characteristics of the rotor 20 are obtained.

As the angle or position of the slots with respect to the holes is disclosed as relevant, it is respectfully submitted that the above features are not simply a matter of design choice.

Third, the last Office Action states on page 4, last full paragraph, that Mannava teaches "the angle in between the reference point and the central position of the adjacent hole." However, the last Office Action fails to disclose where Mannava teaches such an angle and Appellant could not find such a teaching. Although the Appellant respectfully requested that the next Office Action indicates the location of such a teaching, the Advisory Action fails to indicate such teaching.

In fact Mannava does not teach or suggest the asserted "reference point" and it appears that the last Office Action relies entirely on edited Figure 1 of Mannava as shown on page 5 of the last Office Action for showing a reference point and an angle between the reference point and a central position of an adjacent hole 18.

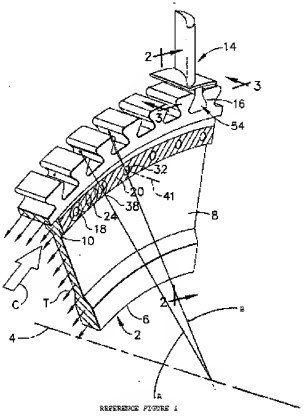
In this regard, it is noted that the last Office Action draws two axes through the asserted reference point (not disclosed by Mannava) and the central position of the adjacent hole 18 and from here the Examiner assumes that there is an angle between the two points. However, as noted in the previously filed response, Mannava does not show these two axes and these axes are generated by the Examiner to support his argument. Because Mannava does not show the two axes, the Examiner must visually determine that there is an angle between 2 and 10 sexagesimal degrees between the two axes.

However, MPEP specifically indicates that this "approach" is not appropriate by stating in section 2125, second full paragraph, that

> When the reference does not disclose that the drawings are to scale and is silent as to dimensions, arguments based on measurement of the drawing features are of little value. See *Hockerson-Halberstadt, Inc. v. Avia Group Int'l*, 222 F.3d 951, 956, 55 USPQ2d 1487, 1491 (Fed. Cir. 2000).

Further, to show how subjective is the Examiner's approach of editing Figure 1 of Mannava, Appellant has provided below the same Figure 1 of Mannava showing holes 18 aligned with corresponding slots (i.e., zero angle), as shown by the two added lines A and B in Reference Figure 1 (see next page), which is contrary to Claims 1 and 14. Note that each of the two added lines intersects both the asserted reference point of the

slot 54 and the hole 18. Thus, this shows that adding axes to Figure 1 of Mannava can be performed to support contradictory positions.



Appellant notes that the entire foundation for the last Office Action's argument that there is an angle (between 2 and 10 sexagesimal degrees) between an asserted reference point and an asserted central position of an adjacent hole in Mannava is based entirely on edited Figure 1 of Mannava, which is not described as being at scale.

Thus, Appellant respectfully submits that the combination of (1) drawings not to scale and (2) axes added by the Examiner (that may or may not be accurate) renders

the entire argument of the last Office Action questionable and contrary to established MPEP practice. For this and other reasons mentioned above, it is respectfully submitted that Mannava fails to teach or suggest the claimed angle.

Nagaoka and Walker have been considered but neither of these references cures the deficiencies of Mannava discussed above.

Therefore, Appellant respectfully requests that this rejection be reversed.

III. Rejection of Claims 14-17 and 21-22 under the combination of Mannava and Walker is improper

a. Mannava and Walker do not teach or suggest the claimed angle

Independent Claim 14 was rejected over the combination of Mannava and Walker.

However, it is noted that independent Claim 14 recites the same angle as Claim 1 discussed above. The last Office Action used the arguments regarding Claim 1 for rejecting Claim 14 over Mannava. Therefore, the arguments presented above with regard to Claim 1 apply for Claim 14 and those arguments are not reiterated herein.

Therefore, Appellant respectfully requests that this rejection be reversed.

IV. Rejection of Claims 18-20 under the combination of Mannava, Nagaoka and Walker is improper

Claims 18-20 depend directly or indirectly from independent Claim 14 discussed above. Thus, for the reasons discussed above with regard to Claim 14 it is believed that depend Claims 18-20 also patentably distinguish over the applied art.

Therefore, Appellant respectfully requests that this rejection be reversed.

Conclusions

As the Examiner has failed to establish any reasonable motivation to combine the references and even if they could, for some unknown reason, be combined, the reference teachings would fail to suggest all the limitations of the rejected claims and thus, reversal of all outstanding rejections is respectfully requested.

Respectfully submitted,
POTOMAC PATENT GROUP PLLC

By: /Remus F. Fetea/
Remus F. Fetea
Registration No. 59,140

Dated: March 2, 2010

(viii) **CLAIMS APPENDIX**

1. A disk of a disk rotor for a gas turbine comprising:

a central portion having a central axis pass-through hole, a first collar situated at a first end and a second collar situated at a second end of the central portion;

an intermediate portion disposed around the central portion;

an outer portion disposed around the intermediate portion, the outer portion having a series of axial pass-through holes configured to receive a series of tie rods and having a series of slots configured to house a corresponding series of vanes, wherein

the series of holes is positioned in the outer portion of the disk so as to obtain high dynamic characteristics of the rotor and at the same time a sufficient useful life thereof, and

each slot has a reference point for placing a corresponding vane, an angle between the reference point of a slot and a central point of an adjacent hole of the series of holes is between 2 and 10 sexagesimal degrees, and the reference point is defined by an intersection of (i) an axis of the slot in a middle side section of the disk with (ii) an extension of a side surface of the outer portion, the axis of the slot being radial from an axial direction of the disk.

2. The disk of a disk rotor for a gas turbine according to claim 1, wherein said series of holes is situated on a base surface of the outer portion.

3. The disk of a disk rotor for a gas turbine according to claim 2, wherein the holes of said series of holes are positioned at an equal distance from each other along a circumference lying on the base surface, said circumference being coaxial with the axial direction of the disk.

4. The disk of a disk rotor for a gas turbine according to claim 1, wherein said first collar comprises a bevel and a relief and said second collar comprises a bevel and a relief.

5. The disk of a disk rotor for a gas turbine according to claim 1, wherein the disk has a total number of holes of the series of holes which is equal to the total number of slots of the series of slots for the series of vanes.

7. The disk of a disk rotor for a gas turbine according to claim 1, wherein said angle ranges from 4 to 8 sexagesimal degrees.

8. The disk of a disk rotor for a gas turbine according to claim 3, wherein the diameter of the circumference is close to the diameter of the disk.

9. A disk rotor for a compressor comprising a series of disks according to claim 1 and also comprising a series of tie rods, and a series of vanes.

11. The disk of a disk rotor for a gas turbine according to claim 1, wherein each slot of the series of the slots is tilted both axially and vertically relative to axial and vertical directions of the disk.

12. The disk of a disk rotor for a gas turbine according to claim 1, further comprising:

the series of vanes, wherein a center of each vane is placed to coincide with the reference point of a corresponding slot.

13. The disk of a disk rotor for a gas turbine according to claim 1, wherein each vane extends along an axis within a corresponding slot that is different from the axial direction.

14. A disk of a disk rotor comprising:

a central portion having a central axis pass-through hole;

an intermediate portion disposed around the central portion;

an outer portion disposed around the intermediate portion, the outer portion having a series of axial pass-through holes and a series of slots in a side surface of the outer portion, wherein

each slot has a reference point for placing a corresponding vane, an angle between the reference point of a slot and a central point of an adjacent hole of the series of holes is between 2 and 10 sexagesimal degrees, and the reference point is

defined by an intersection of an axis of the slot in a middle side section of the disk with an extension of the side surface of the outer portion, the axis of the slot being radial from an axial direction of the disk.

15. The disk of a disk rotor according to claim 14, wherein each slot of the series of the slots is tilted both axially and vertically relative to axial and vertical directions of the disk.

16. The disk of a disk rotor according to claim 14, further comprising:

a series of vanes configured to be attached to the series of slots.

17. The disk of a disk rotor according to claim 16, wherein a center of each vane is placed to coincide with the reference point of each slot.

18. The disk of a disk rotor according to claim 14, wherein the central portion further comprises:

a central axis pass-through hole;

a first collar situated at a first end of the central portion; and

a second collar situated at a second end of the central portion.

19. The disk of a disk rotor according to claim 18, wherein a diameter of the first collar is smaller than a diameter of the second collar.

20. The disk of a disk rotor according to claim 18, wherein the first collar fits inside the second collar.

21. The disk of a disk rotor according to claim 14, wherein the disk is part of a gas turbine.

22. The disk of a disk rotor according to claim 14, further comprising:

a series of vanes, wherein each vane extends along an axis within a corresponding slot that is different from the axial direction.

(ix) **EVIDENCE APPENDIX**

None.

(x) **RELATED PROCEEDINGS APPENDIX**

None.